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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,946	BIRLE ET AL.	
	Examiner	Art Unit	
	DANIEL A. BERNSTEIN	3743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 11-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 11-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/25/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the drawings in Fig. 1 and Fig. 2 must show how the water cooled ring is rotatable about the axis of the gas injector **in claim 19** or the feature(s) canceled from the claim(s). No new matter should be entered. Based on the definition of "rotatable" the drawings should show means for rotating the water cooled ring. **The applicant argues that one of ordinary skill in the art would know how to mount the ring in such a way that the ring is capable of rotational movement about the diffuser, the examiner respectfully disagrees with this assertion. The issue with claim 19 is not whether one of ordinary skill in that art knows how to mount a rotatable ring, but rather the fact that the ring as shown in Fig. 1-3 appears to be fixed to the supply of cooling water at 14. The examiner would like for the applicant to explain how one of ordinary skill in the art would rotate the ring at 5 with respect to the fixed cooling supply at 14 not with respect to the outer diameter of the diffuser before this objection to the drawings can be withdrawn.**

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure

is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: The applicant fails to appropriately describe what is meant by the notional prolongation of the generatrix. As these terms are not obvious to one of ordinary skill in the art, the examiner recommends that these terms should be clearly defined.

Appropriate correction is required.

The examiner agrees, that one of ordinary skill in the art can understand the meaning of groups of words that are not commonly used by merely combining the meaning of each word and interpreting the meaning of the phrase in the context of the claim language. However, in this case, the applicant is attempting to claim an axis and the prolongation of that axis which is aligned about the length of the fuel injector. Terms describing the generatrix phrase such as claiming the extension of a horizontal axis that is aligned through the central

axis of the diffuser would assist one of ordinary skill in understanding the meaning of the phrase.

3. Claim 11 objected to because of the following informalities: The applicant claims the notional prolongation of the generatrix and it is unclear and very difficult to discern what the applicant is intending to claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 26 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original specification does not describe that the gas injector is rotatable about the center point of the mouth .

6. Claim 19 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The applicant is claiming that the water cooled ring is rotatable about the axis of the gas injector and it is unclear whether the applicant means that the water cooled ring is radially aligned about the central axis of the gas injector or if the water cooled ring is

capable actually rotating about the central axis of the gas injector. For the examination of the claims the examiner is assuming based on the drawings that the water cooled ring is fixed and not capable of rotating.

The applicant argues that one of ordinary skill in the art would know how to mount the ring in such a way that the ring is capable of rotational movement about the diffuser, the examiner respectfully disagrees with this assertion. The issue with claim 19 is not whether one of ordinary skill in that art knows how to mount a rotatable ring, but rather the fact that the ring as shown in Fig. 1-3 appears to be fixed to the supply of cooling water at 14. ***The examiner would appreciate an explanation of how one of ordinary skill in the art would rotate the ring at 5 with respect to the fixed cooling supply at 14 not with respect to the outer diameter of the diffuser before this rejection can be withdrawn.***

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 1 recites the limitation "the ratio" in line 4. There is insufficient antecedent basis for this limitation in the claim.

9. Claim 1 recites the limitation "the connection" in line 3 (referring to the connection between a first diameter and a mouth of a second diameter of the gas supply pipe). The problem with claiming "the" connection is that the applicant has not defined a positive relationship between the first and second diameter and one of ordinary skill in the art would not infer that they are connected. It would be proper to claim that the first

and second diameter are connected before referring back to "the connection". There is insufficient antecedent basis for this limitation in the claim.

10. Claim 11 recites the limitation "the notional prolongation" and "the generatrix" in line 4 and 5. There is insufficient antecedent basis for this limitation in the claim. Both of these terms lack antecedent basis.

11. Claim 19 recites the limitation "the gas injection" in line 2. There is insufficient antecedent basis for this limitation in the claim.

13. Regarding claim 26, the phrase "in such a way" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 1, 11 and 23 rejected under 35 U.S.C. 102(b) as being anticipated by US 5,620,316 to Duboudin et al.

Duboudin teaches:

In Reference to Claim 1

A gas injector (see Fig. 1) for nitrogen oxide-reducing firing of regeneratively heated industrial furnaces comprising a gas supply pipe (pipe 8) **having a first diameter** (pipe 8 has a first diameter De) and a mouth **of a second diameter** (8 opens at 5 and 5 has a second diameter Ds), wherein the connection thereof forms a long diffuser (diffuser 2) with a free jet opening angle (see angle α), characterized in that the

ratio of the diameter of the mouth (Ds) and the diameter of the gas supply pipe (De) is smaller than three (the ratio of Ds/De is preferably less than 2, Col. 2 lines 61-68, also see claim 2).

In Reference to Claim 11

A gas injector as set forth in claim 1 **wherein** a central nozzle pipe (6) with a mouth (6 opens at 7) forming a free jet opening angle (6 opens at an angle that is aligned along the axis of flow) is arranged within the gas supply pipe (6 is carried inside of 8), forming an annular gap (space between 6 and 8) for guiding a partial gas flow (8 carries oxygenated combustible gas having an oxygen content of at least 5%, Col. 2 lines 50-55) between the gas supply pipe (8) and the central nozzle pipe (6), in such a way that the notional prolongation of the generatrix of the central nozzle pipe (6) mouth **over the gap** goes into the generatrix of the long diffuser (it is unclear what the prolongation of the generatrix is referring to based on the specification, but if it is the angle formed between the mouth of the nozzle and the diffuser then 6 opens into the region where the angle α of the diffuser starts).

In Reference to Claim 23

In regards to claim 23, Duboudin shows a fuel gas injector arrangement comprising a gas fuel injector according to claim I and an air supply (air supply tube 1, Fig. 1) wherein the air supply is arranged separately from the fuel gas injector (the air supply tube is separate from the fuel supply which enters the burner through tube 6, see Fig. 1).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claims 12-16 rejected under 35 U.S.C. 103(a) as being unpatentable over Duboudin in view of US 6,190,158 to Legiret et al.

In Reference to Claim 12

Duboudin discloses a gas injector as set forth in claim 11 but does not teach a closure and regulating device for partial gas flow adjustment is arranged **upstream** of the central nozzle pipe.

Legiret teaches a gas injector that has valves (13, 14 and 16), which control the flow of gases into the injector and are located upstream the central nozzle pipe.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Duboudin with Legiret for the purpose of providing the gas injector valves to control the flow of gases through the gas injector. It is well known to valve fluids entering the injector of a gas burner so that combustion of the gases can be controlled effectively during combustion. Therefore it would have been obvious to combine Duboudin with Legiret because all of the claimed elements

were known in prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

In Reference to Claim 13

Duboudin in view of Legiret discloses a gas injector as set forth in claim 12 **wherein** the closure device comprises two separate valves (13 and 14, Fig. 1, Legiret) which are arranged in an overall gas supply pipe (oxidant gas source 12) and a secondary gas supply pipe (pipe feeding through valve 13 feeds into central nozzle pipe 8) which is branched therefrom and which directly charges the central nozzle pipe.

In Reference to Claim 14

Duboudin discloses a gas injector as set forth in claim 11, **wherein the central nozzle pipe** (central nozzle pipe 6, Duboudin, Fig. 1) **has an outer periphery** (outer wall of central nozzle pipe 6) **and the gas supply pipe has an inside wall** (inside wall of 8), but does not teach **wherein a** closure device is in the form of a cone which is axially displaceable on the outer periphery of the central nozzle pipe and which co-operates with a conical surface of the inside wall of the gas supply pipe.

Lang teaches a closure device (handle 8 and cone 18, Fig. 1) is in the form of a cone (18 is a cone) which is axially displaceable (Fig. 1 shows 18 in the fully open position and Fig.2 shows 18 in the closed position, the cone 18 moves axially along the center axis of the burner) on the outer periphery of the central nozzle pipe and which

co-operates with a conical surface (conical surface 30) of the inside wall of the gas supply pipe.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Duboudin with Lang for the purpose of adding a closure device on the outer periphery of the central nozzle for the purpose of controlling the amount of gas flowing through the gas supply pipe. Lang teaches a valve mechanism where a handle is used to adjust the lengthwise position or axial position of the nozzle to control the flow of a fluid. It would have been obvious to combine Duboudin with Lang, because a person of ordinary skill has good reason to pursue the known options for valving a fluid in a burner within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary common sense. Furthermore, all of the claimed elements were known in prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

In Reference to Claim 15

Duboudin in view of Legiret discloses a gas injector as set forth in claim 12 **wherein the central nozzle pipe has an inside diameter** (inside diameter De, Duboudin, Fig. 1) **and wherein** the closure device (valve 13 is opposite the end of the nozzle opening at 8, see Fig. 1 or Legiret) is **spaced** from the mouth (valve 13 is disposed behind the gas injector and is opposite the mouth of the injector at 8, Legiret)

of the central nozzle pipe **a distance of** (8, Legiret) more than five times the inside diameter of the central nozzle pipe (the nozzle is substantially spaced from the mouth by well more than 5 times the diameter of inner nozzle 8, Legiret, Fig. 1).

17. Claims 14 and 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Duboudin in view of US 1,679,830 to Lang.

In Reference to Claim 16

Duboudin in view of Lang discloses a gas injector as set forth in claim 14 **wherein the central nozzle** (central nozzle pipe 6, Duboudin, Fig. 1) **pipe has an inside diameter** (inside diameter of pipe 6) **and wherein** the closure device (8 and 18, Fig. 1, Lang) is **spaced** from the mouth of the central nozzle pipe by more than five times the inside diameter of the central nozzle pipe (the handle which controls the position of 18 is disposed more than five times the inside diameter of the central nozzle pipe and is opposite the mouth opening).

18. Claims 17-19 rejected under 35 U.S.C. 103(a) as being unpatentable over Duboudin in view of US 5,515,794 to Kassman et al.

In Reference to Claim 17

Duboudin teaches a gas injector as set forth in claim 1, but does not teach that the mouth of the long diffuser is provided with a water-cooled ring at its outside periphery.

Kassman teaches a burner that has a cooling water jacket that surrounds the burner gas injector (see Fig. 2 where water enters in the coolant supply line circles

around the burner nozzle and exits in the coolant return line, the jacket 21 encircles the outer periphery of the burner nozzle).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Duboudin with Kassman for the purpose of cooling the gas injector to prevent damage to the injector due to high combustion temperatures. It is well known in the art to cool gas injection nozzles of burners with annular sleeves that run coolants, such as water, to cool the outer surface of gas injectors as evidenced by Kassman. Therefore it would have been obvious to one of ordinary skill in the art to combine Duboudin with Kassman because all of the claimed elements were known in prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

In Reference to Claim 18

Duboudin in view of Kassman discloses a gas injector as set forth in claim 17 **wherein** the water-cooled ring is arranged separately (21 of Kassman is arranged separately of the burner nozzle, 21 is wrapped around the gas injector, See Fig. 1 and Fig. 2).

In Reference to Claim 19

Duboudin in view of Kassman discloses a gas injector as set forth in claim 17 **wherein the gas injection** (this term lacks antecedent basis and should be claimed as

"the gas injector") **has a longitudinal axis** (longitudinal axis of the gas injector of Fig. 1, Duboudin) **and** the water-cooled ring is rotatable about **said** axis of the gas injector (as discussed above in the objection to claim 19, the applicant does not show how the water cooled ring can rotate about the gas injector. The ring appears to be fixed in figures 1-3 and therefore in regards to the term "rotatable", the water cooled ring is interpreted to be disposed in radial alignment with the gas injector. Kassman shows a water cooled ring 21 which is wrapped around the gas injector, see Fig. 2).

19. Claim 20-21 rejected under 35 U.S.C. 103(a) as being unpatentable over Duboudin in view of Kassman and US 6,199,367 to Howell.

In Reference to Claim 20

Duboudin discloses an **industrial furnace** (Duboudin's apparatus as shown in Fig. 1 is used in a furnace) **having a burner insert opening** (burner opening at 10) **and a fuel** gas injector (apparatus of Fig. 1) **having a longitudinal axis** (longitudinal axis formed along the length of pipe 8) and having **a gas supply pipe** (pipe 8 has a first diameter De) **of a first diameter and a mouth** (8 opens at 5) **of a second diameter** (second diameter Ds), **wherein the connection thereof** (tapered connection at 9) **forms a long diffuser** (long diffuser 2) **with a free jet opening angle** (free jet opening angle alpha) **and wherein the ratio of the second diameter** (Ds) **of the mouth and the first diameter** (De) **of the gas supply pipe is smaller than three** (the ratio of Ds/De is preferably less than 2, Col. 2 lines 61-68, also see claim 2), but does not teach **wherein the mouth of the long diffuser is provided with a water-cooled ring at its outside periphery** and **wherein** the long diffuser and the ring are arranged together in

said burner insert opening, **said burner insert opening having a diameter that varies along its length with its smallest diameter coincident with said water-cooled ring such that the** spacing between the water-cooled ring and the burner insert opening is at a minimum and said axis of the gas injector is rotatable about the center point of the mouth (see discussion of rotatable above)

Kassman teaches a burner that has a cooling water jacket that surrounds the burner gas injector (see Fig. 2 where water enters in the coolant supply line circles around the burner nozzle and exits in the coolant return line, the jacket 21 encircles the outer periphery of the burner nozzle). The water cooled ring 21 of Kassman is closely spaced to the outer wall of the gas injector and it encircles the outer portion of the gas injector. The water cooling ring of Kassman is located at the end of the burner and would be coincident with the smallest diameter of the burner insert.

Howell teaches an air modulated carburetor with axially moveable fuel injector tip and swirler assembly responsive to fuel pressure in which the **burner insert opening** (burner insert opening 46, Fig. 2) **having a diameter** (the injector insert opening 46 varies along its length so that combustion air 28 is pulled into the chamber) **that varies along its length** for the purpose of modulating the flow rate of compressed air 28 into the combustor 16.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Duboudin with Kassman for the purpose of cooling the gas injector to prevent damage to the injector due to high combustion temperatures. It is well known in the art to cool gas injection nozzles of burners with

annular sleeves that run coolants, such as water, to cool the outer surface of gas injectors as evidenced by Kassman. Therefore it would have been obvious to one of ordinary skill in the art to combine Duboudin with Kassman because all of the claimed elements were known in prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Duboudin with Howell for the purpose of modifying the burner insert opening so that air is easily drawn to the burner to facilitate and maintain stable combustion. It is well known to someone of ordinary skill in the art that a nozzle can be used to increase the discharge velocity and to direct the flow in one particular direction for the purpose of accelerating air to the combustion zone as evidenced by Howell. Therefore, it would have been obvious to one of ordinary skill in the art to combine Duboudin with Howell for the purpose of accelerating combustion air to the burner so that stable combustion is maintained.

In Reference to Claim 21

Duboudin in view of Kassman and Howell discloses the fuel gas injector according to claim I wherein said free jet opening angle is approximately 20 degrees (Duboudin disclose that the angle alpha does not exceed 45 deg, see Col. 3 lines 1-5,

since the angle is somewhere below 45 degrees then Duboudin teaches approximately 20 degrees).

20. Claim 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Duboudin in view of Kassman and US 7,175,423 to Pisano et al.

In Reference to Claim 22

Duboudin in view of Kassman discloses a fuel gas injector according to claim I wherein a central nozzle pipe (central nozzle pipe 6, Fig. 1, Duboudin) with a mouth (mouth at 7) forming a free jet opening angle (the opening angle is a parallel with the gas supply pipe 6) is arranged within the gas supply pipe, but does not teach wherein the free jet opening angle of the mouth is approximately equal to said free jet opening angle at the long diffuser.

Pisano teaches an air staged low-nox burner in which a central nozzle pipe has a free jet opening angle that is approximately equal to said free jet opening angle of a diffuser (see Fig. 2-4 where Pisano shows a free jet opening angle at 28 which is approximately equal to the angle of the diffuser) for the purpose of efficiently mixing the fuel and air (Col. 3 lines 17-28).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Duboudin with Pisano for the purpose of efficiently mixing the fuel with combustion air using the "Coanda effect". Pisano teaches that it is well known to someone of ordinary skill in the art to match the angle at which fuel and air leave a nozzle to the diffuser so that a swirling effect is established which

promotes efficient mixing of the gas and combustion air. More efficient mixing of gas and air leads to more complete combustion which would increase the burner efficiency. Therefore, it would have been obvious to someone of ordinary skill in the art to combine Duboudin with Pisano in order to increase the burner efficiency.

21. Claim 24-25 rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,199,367 to Howell in view of Duboudin.

In regards to claim 24, Howell discloses a burner insert opening (burner insert opening in Fig. 2) comprising a gas injector arrangement (Fig. 2) having a fuel gas injector (fuel gas injector 26) arranged in the burner insert opening (gas injector of Fig.2 is arranged in a burner insert opening), said fuel gas injector having a gas supply pipe (gas supply 30 travels through pipe 42a) and a mouth (mouth at 44b), wherein the connection thereof forms a long diffuser (diffuser 44b) with a free jet opening angle (diffuser 44b has some opening angle as can be seen in fig. 2), but does not teach wherein the ratio of the diameter of the mouth and the diameter of the gas supply pipe is smaller than three.

Duboudin teaches an industrial furnace (see Fig. 1), an injector wherein the ratio of the diameter of the mouth (Ds) and the diameter of the gas supply pipe (De) is smaller than three (the ratio of Ds/De is preferably less than 2, Col. 2 lines 61-68).

Howell discloses where the fuel and combustion air are introduced separately for the purposes of accelerating the fuel through a venturi (see Fig. 2 where fuel 30 and air 28 are introduced into the combustion chamber separately). Howell teaches that the air

supply is arranged separately from the fuel gas injector (the air supply 28 is arranged separately from the fuel injector as shown in Fig. 2).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Howell with Duboudin for the purpose of optimizing and designing the flow characteristics of the fuel injector so that turbulence is reduced and points of elevated temperature in the opening is prevented, reducing the nitrous oxide emissions of the burner. It is well known that the speed at which fuel is injected into a burner can cause unwanted swirling of the fuel causing hot spots which will increase nitrous oxide emissions. Therefore, it would have been an obvious design choice to combine Howell with Duboudin for the purpose of reducing nitrous oxide emissions by slowing the injection velocity of fuel and oxidant (see Col. 1 lines 30-42 of Duboudin).

In regards to claim 25, Howell in view of Duboudin discloses an industrial furnace of claim 24 wherein a distal end of said mouth (Howell shows the distal end of the mouth of the injector at 44b) aligns with a distal end (distal end of the combustor at 46) of the burner insert opening (the distal end of the fuel injector of Howell aligns with the mouth of the combustor, see Fig. 1).

22. Claim 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Duboudin in view of Howell, US 6,755,355 to Whittaker and US 1,679,830 to Lang.

In regards to claim 26, Howell in view of Duboudin discloses an industrial furnace having a burner insert opening according to claim 24, but does not teach wherein the mouth of the long diffuser is provided with a water-cooled ring at its outside periphery

and wherein the long diffuser and the ring are arranged together in the burner insert opening.

Duboudin in view of Howell discloses that the burner insert enlarges in opposite relationship to the gas flow direction (the burner insert opening of Howell converges in the direction of the gas flow from numeral 46 to 38, see Fig. 2).

Whittaker teaches a burner that has a cooling water jacket that surrounds the burner gas injector (see Fig. 3 where water jacket 60 surrounds nozzle shell 46) wherein the mouth of the long diffuser is provided with a water-cooled ring at its outside periphery (the water cooled ring 60 of Whittaker is closely spaced to the outer wall of the gas injector) and wherein the long diffuser and the ring is arranged in such a way that the spacing between the water-cooled ring and the burner insert opening is at a minimum (see Fig. 1 where Whittaker shows that nozzle 30 is spaced at a minimum to the burner insert opening wall at 14).

Lang discloses a liquid fuel burner in which and the axis of the gas injector is rotatable (Lang shows an adjustable nozzle where the oil nozzle 5 is adjustable by rotating handle 8 and the primary air injector is adjustable by rotating hand wheel 19, see Fig. 1-2) about the center point of the mouth for the purpose of controlling the air and fuel feeds manually.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Howell with Whittaker for the purpose of cooling the gas injector to prevent damage to the injector due to high combustion

temperatures. It is well known in the art to cool gas injection nozzles of burners with annular sleeves that run coolants, such as water, to cool the outer surface of gas injectors as evidenced by Whittaker. Furthermore it is also well known that the tip of a burner nozzle can heat up generating hot spots at the tip of the nozzle. These hot spots can lead to increased nitrous oxide emissions. Therefore it would have been obvious to one of ordinary skill in the art to combine Howell with Whittaker for the purpose of cooling the burner nozzle in order to reduce hot spots at the tip of the nozzle, thereby reducing the nitrous oxide emissions of the burner.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Howell with Lang for the purpose of providing the burner with manual adjustments of the nozzle so that the supply feeds to the burner can be manually controlled by the user. It is well known to provide a burner with a rotationally controlled fuel feed in which the user can adjust the burner manually while the burner is operating. Typically, a burner feed is controlled either manually or automatically by a microprocessor. A manual control would be beneficial over an automatic control in that the maintenance in a manual control unit would cost less money and the control unit itself would typically be cheaper in price than a manual control. Therefore, it would have been an obvious design choice to operate the burner of Howell manually as taught by Lang for the purpose of reducing costs by eliminating the need for an automatic control unit.

Response to Arguments

23. Applicant's arguments filed 10/05/2009 have been fully considered but they are not persuasive.

In regards to claims 1 and 11 the applicant argues that the reference of Duboudin is non-analogous art since Duboudin teaches an injector that introduces both air and fuel when the applicant's invention only injects fuel. However, one of ordinary skill in the art of injectors would have basic knowledge on fuel ejectors which eject both fuel and oxidant or just fuel. Furthermore, all ejectors belong to the group of nozzles which deal with delivering a fluid and the structure of each nozzle despite of what the nozzle delivers are considered within the same field of endeavor. It would not be uncommon for one of ordinary skill to use nozzles found in the water sprinkler art to design a nozzle in the fuel delivery art in order to impart a particular flow characteristic to that fuel.

In regards to claims 12-13 and 15, the applicant has also argue that the references cited are non-analogous art. As stated above, one of ordinary skill in the art would use knowledge of oxyburners to design flow characteristics of a fuel injector.

Conclusion

24. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL A. BERNSTEIN whose telephone number is (571)270-5803. The examiner can normally be reached on Monday-Friday 8:00 AM - 5:00 PM EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Rinehart can be reached on 571-272-4881. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DAB

/Kenneth B Rinehart/
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